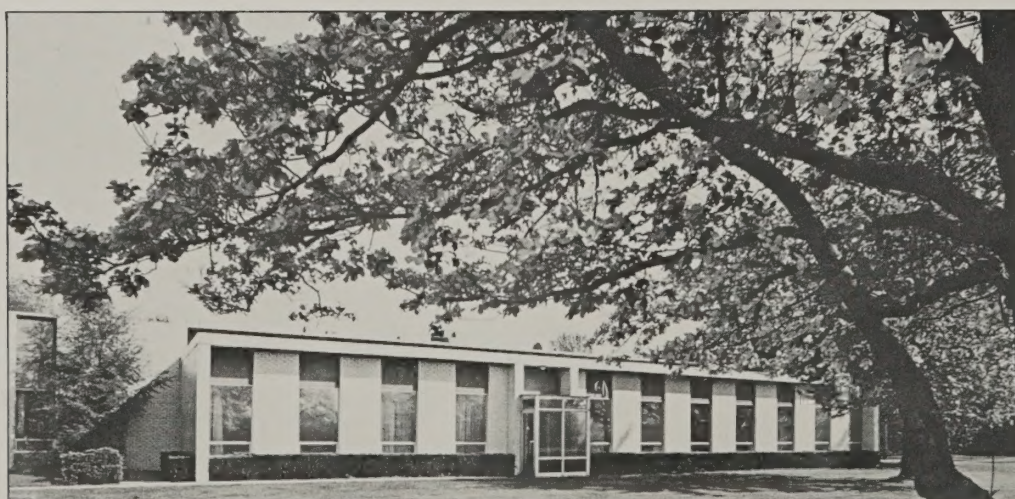


BOOKS NOTES

CATALOG 1979/1980

Model Number Index

		Page
10A	IEEE-488 BUS INTERFACE MODULE	13
25A	POWER CALIBRATOR -69 to +20 dBm, 1 MHz, to Calibrate all Boonton Microwattmeters	5
26A	VOLTAGE CALIBRATOR 60 μ V — 3000 mV, 1 MHz, to Calibrate all Boonton RF Millivoltmeters	4
33A/1	ADMITTANCE BRIDGE (1-100 MHz) 0 — 150 pF, 0 — 25 mS	11
33B/1	ADMITTANCE BRIDGE (1-100 MHz) 0 — 150 pF, 0 — 5 mS	11
33C/1	ADMITTANCE BRIDGE (1-100 MHz) 0 — 15 pF, 0 — 25 mS	11
33D/1	ADMITTANCE BRIDGE (1-100 MHz) 0 — 15 pF, 0 — 5 mS	11
34A	RESONANT COAXIAL LINE High frequency Q measuring system. Requires an additional 102D and 92B	11
42B	RF MICROWATTMETER (10 nW — 10 mW fs, Analog)	5
42BB	RF MICROWATTMETER (10 nW — 10 mW fs, Analog/Battery)	5
42BD	RF MICROWATTMETER (10 nW — 10 mW fs, Digital)	5
42C	RF MICROWATTMETER (100 nW — 100 mW fs, Analog)	5
42CB	RF MICROWATTMETER (100 nW — 100 mW fs, Analog/Battery)	5
42CD	RF MICROWATTMETER (100 nW — 100 mW fs, Digital)	5
62A	INDUCTANCE METER (1 MHz) 1 — 3000 μ H fs, Analog	12
62AD	INDUCTANCE METER (1 MHz) 2 — 2000 μ H fs, Digital	12
63H	INDUCTANCE BRIDGE 0.2 nH — 110 mH, 5 — 500 kHz	12
63L	INDUCTANCE BRIDGE 20 nH — 11 H, 0.4 — 40 kHz	12
63M	INDUCTANCE BRIDGE 2 nH — 1.1 H, 1 — 100 kHz	12
72B	CAPACITANCE METER (1 MHz) 1 — 3000 pF fs, Analog	10
72BD	CAPACITANCE METER (1 MHz) 2 — 2000 pF fs, Digital	10
75D	CAPACITANCE BRIDGE (1 MHz) 0 — 1000 pF, 0 — 1000 μ S	12
76A	CAPACITANCE BRIDGE (1 MHz) 0 — 2000 pF, 0 — 2000 μ S Microprocessor Auto. Balance	9
76-7A	CAPACITANCE SORTING MODULE (see Model 76A-05)	10
82AD	FM-AM MODULATION METER 10, 100, 300 kHz fs FM; 10, 100% fs AM; 10 — 1200 MHz	6
92B	RF MILLIVOLTMETER (1 mV — 3 V fs, 10 kHz — 1.2 GHz, Analog)	4
92B-S5	RF MILLIVOLTMETER (1 mV — 3 V fs, 10 kHz — 1.2 GHz, Analog) Including: 91-6C, 91-7C, 91-14A, 91-15A, 91-18A ...	4
92BB	RF MILLIVOLTMETER (1 mV — 3 V fs, 10 kHz — 1.2 GHz, Analog/Battery)	4
92BD	RF MILLIVOLTMETER (1 mV — 3 V fs, 10 kHz — 1.2 GHz, Digital)	4
92C	RF MILLIVOLTMETER (3 mV — 3 V fs, 10 kHz — 1.2 GHz, Analog)	4
93A	RMS VOLTMETER (1 mV — 300 V fs, 10 Hz — 20 MHz, Analog)	5
93AD	RMS VOLTMETER (1 mV — 300 V fs, 10 Hz — 20 MHz, Digital)	5
102C	FM-AM SIGNAL GENERATOR (450 kHz — 520 MHz)	7
102D	FM-AM SIGNAL GENERATOR (450 kHz — 520 MHz) Phase Lock	7
103C	FM-AM SIGNAL GENERATOR (125 kHz — 175 MHz)	8
103D	FM-AM SIGNAL GENERATOR (125 kHz — 175 MHz) Phase-Lock	8
170 Series	CAPACITANCE-SORTER CONTROL SYSTEMS	13
	ACCESSORIES	14
	INSTRUMENT OPTIONS	18



Accessory Reference

The following list shows accessories that apply to each instrument.

INSTRUMENT	ACCESSORIES
10A	92-12A, 92-12B, 92-12C
25A	91-6G, 92-1A, 92-1B
26A	92-1A, 92-1B
33 Series	75-5A, 33-1A thru 33-20B
34A	34-1A thru 34-4C, 102-1A
42 Series	41-2A thru 41-5E 42-7A thru 42-13A 92-1A, 92-1B, 92-6A, 92-8A, 92-9A, 92-12A, 92-12B, 92-12C
62 Series	62-1A, 62-2A, 92-1A, 92-1B, 92-6A, 92-8A, 92-9A, 92-12A, 92-12B, 92-12C
72 Series	71-1A, 71-2A, 71-12A 72-4B, 72-5C, 72-13A 76-1A, 76-3A, 77-4A 92-1A, 92-1B, 92-6A, 92-8A, 92-9A, 92-12A, 92-12B, 92-12C
75D	35-8A, 75-5A, 75-7A, 76-1A, 76-3A, 77-2A
76A	35-8A, 76-1A thru 76-9A 77-2A, 102-3A
82AD	82-1A, 82-2A
92 Series	42-13A 91-4C thru 91-25A 92-1A thru 92-12C
93 Series	92-1A, 92-1B, 92-6A, 92-12A, 92-12B, 92-12C 93-1A thru 93-6A
102 Series	102-1A, 102-3A, 102-4A
103 Series	102-3A, 102-4A, 103-1A, 103-2A, 103-3A

Warranty

Boonton Electronics Corporation warrants its products to the original purchaser to be free from defects in material and workmanship and to operate within applicable specifications for a period of one year from date of shipment, provided they are used under normal operating conditions. This warranty does not apply to active devices that have given normal service, to sealed assemblies which have been opened, or to any item which has been repaired or altered without our authorization.

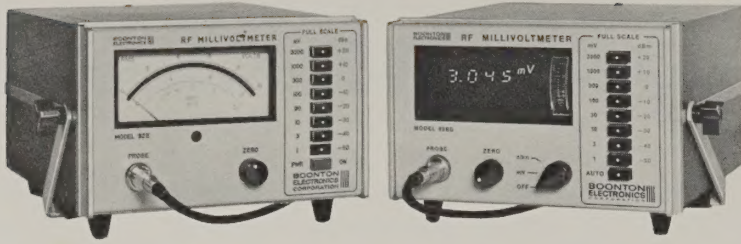
We will repair, or, at our option, replace any of our products which are found to be defective under the terms of this warranty.

There will be no charge for parts, labor, or forward and return shipment during the first three months of this warranty.

There will be no charge for parts, labor, or return shipment during the fourth thru twelfth month of this warranty.

Except for such repair or replacement, we will not be liable for any incidental damages or for any consequential damages, as those terms are defined in Section 2-715 of the Uniform Commercial Code, in connection with products covered by this warranty.

RF Millivoltmeters Model 92 Series



These rf millivoltmeters offer the best choice for sensitive, wide-band, accurate rf voltage measurements.

Model 92B, a programmable analog version, has a large mirrored-scale meter with linear 0-3 and 0-10 voltage ranges, a dBm scale (1 mW into 50 Ω) and dc output.

Model 92B-S5, substantially same as Model 92B with mechanical strengthening to withstand greater shock and vibration, and extra humidity protection. 91-24A Probe Kit included.

Model 92BB is identical to Model 92B but with the addition of internal rechargeable batteries.

Model 92BD, a programmable digital version, has 4 digit display, serial BCD data outputs, dc output. Major options are dBm display (0.01 dB resolution) and autoranging.

Model 92C, a low-cost analog version, saves by eliminating programming and dc output, by making the most sensitive range 3 mV fs, and by working to a more modest accuracy specification.

Data Bus

The Model 92BD may be adapted to the IEEE-488 Standard Data Bus by use of the Model 10A-04 Bus Interface Unit (see this catalog).

SPECIFICATIONS

Analog Model 92B

Voltage Range: 200 μ V to 3V (300 V up to 700 MHz with divider). Useful indications down to 100 μ V.

Frequency Range: 10 kHz to 1.2 GHz.

Basic Accuracy: $\pm(1\% \text{ rdg} + 1\% \text{ fs})$.

Indicator: 4 1/2" taut-band meter; scales 0-3, 0-10 and dBm.

Remote Control: All functions and ranges commanded by TTL inputs.

DC Output: 10 V fs.

Options: Many scale variations, other dB references, rear input.

Analog Battery Model 92BB

Specifications same as 92B. Sealed lead-acid rechargeable 6 hour battery.

Digital Model 92BD

Voltage Range: 200 μ V to 3V (300 V up to 700 MHz with divider).

Frequency Range: 10 kHz to 1.2 GHz.

Basic Accuracy: $\pm(1\% \text{ rdg} + 1\% \text{ fs})$.

Display: 4 digit LED, reads 1000 fs for "10" ranges and 3000 fs for "3" ranges. Small analog meter to right of display is scaled in dBm.

Data Outputs: BCD (serial) digits, binary coded range information. Overrange, underrange, encode complete.

Remote Control: All functions and ranges commanded with TTL inputs.

DC Output: 10 V fs.

Options: Autoranging, digital dBm readout (0.01 dB resolution), other dB references, rear input, BCD serial/parallel converter.

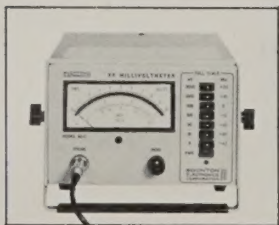
Model 92C

Voltage Range: 500 μ V to 3V (300 V up to 700 MHz with divider).

Frequency Range: 10 kHz to 1.2 GHz.

Basic Accuracy: $\pm(1\% \text{ rdg} + 2\% \text{ fs})$.

Indicator: 4 1/2" taut-band meter; scales, 0-3, 0-10 and dBm.



FURNISHED ACCESSORIES



RF Probe with low noise cable and connector	91-12F
50 Ω BNC Adapter; 1 kHz to 600 MHz	91-8B*
Removable Probe Tip with grounding clip lead	91-13B

OPTIONAL RF ACCESSORIES

Low Frequency Probe, 1 kHz to 250 MHz	91-4C
Unterminated BNC Adapter	91-6C†
100:1 Voltage Divider, 50 kHz to 700 MHz	91-7C
Type N Tee Adapter, 1 kHz to 1.2 GHz	91-14A*†
Type N 50 Ω termination (use with 91-14A)	91-15A*
Unterminated Type N Adapter	91-16A
Storage container for accessories	91-18A
Accessory Kit: Comprises 91-6C, 91-7C, 91-14A, 91-15A, 91-18B	91-24A*

* Available in 75 Ω versions (Reduced freq. range.)

† Available with male input (91-6G, 91-14B)

RF Millivoltmeter Calibrator Model 26A



Provides full scale and incremental signal levels required for calibration of all Boonton RF Millivoltmeters.

Dynamic Range: 60 μ V to 3000 mV

Full Scale Functions: 0.3, 1, 3, 10, 30, 100, 300, 1000, 3000 mV

Down Scale Increments: 20 — 100% fs, 10% fs steps

Calibration Uncertainty: $< \pm 0.5\% \text{ rdg}$
(at 25°C)

Harmonic Distortion: $< 0.15\%$

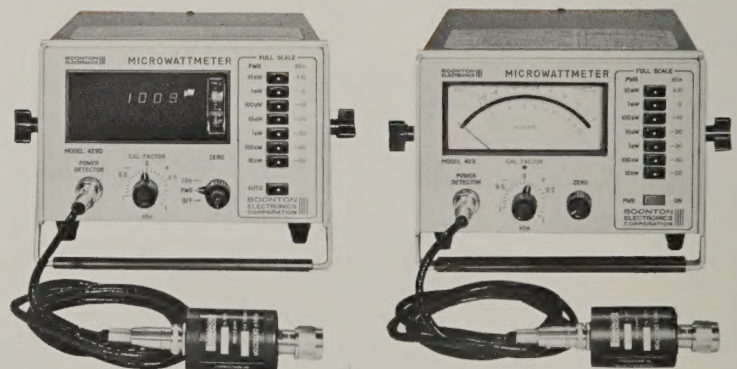
Temperature Influence: $+0.01\%/^{\circ}\text{C}$
(0 - 50°C)

Output Frequency: 1 MHz, xtal controlled

Output Impedance: 25 Ω

Accessory: Model 91-6G male BNC open circuit probe adapter

RF Microwattmeters Model 42 Series



STANDARD VERSIONS

Virtually drift-free, these sensitive power meters cover a dynamic range of 70dB from 1 nW to 10 mW (-60 to +10 dBm.) Overload tolerance is 0.3 W cw. Three 50 Ω power detectors offer a choice of frequency range. All start at a low 200 kHz covering up to as high as 18 GHz. A 75 Ω detector is available for CATV applications. The analog models (line or battery) are scaled in power and dBm. The digital model gives 3 1/2 digit resolution for power and 4 digit resolution (0.01 dB) for the optional dBm display. Autoranging is also available.

HIGHER POWER VERSIONS

Specifically designed to use the higher power detector Model 41-5E these power meters cover a power range of 10 dB higher than the standard models and provide low VSWR. The dynamic range of 70 dB covers power measurements from 10 nW to 100 mW (-50 to +20 dBm.) Overload tolerance is greater than 2W cw. All features and options of the standard models apply.

Data Bus

The Models 42BD and 42CD may be adapted to the IEEE-488 Standard Data Bus by use of the Model 10A-01 and 10A-06 Bus Interface Units (see this catalog).

SPECIFICATIONS (Standard Versions)

Digital Model 42BD

Power Ranges: 10 nW fs to 10 mW fs.

Frequency Range: 200 kHz to 18 GHz.

Accuracy: Overall, instrument and detector.

$\pm(0.2 \text{ dB} + 1 \text{ digit})$ to $\pm(0.8 \text{ dB} + 1 \text{ digit})$ depending on power range and frequency.

Stability: <1 nanowatt/hour at 25°C

Temperature Effect: 0.007 dB/°C typ.

Indicator: 3½ digit LED display for power, 4 digit for dBm option

Data Outputs: BCD (serial) digits, binary coded range, over-range under-range, encode complete, TTL.

Remote Control: Input range, encode hold and trigger, manual disable, dBm and autorange commanded by TTL inputs.

DC Output: 10 V fs proportional to power.

Major Options: Autoranging, dBm display, BCD serial/parallel converter.

Analog Model 42B

Power Ranges: 10 nW fs to 10 mW fs.

Frequency Range: 200 kHz to 18 GHz.

Accuracy: Overall instrument and detector. $\pm(0.2 \text{ dB} + 0.5\% \text{ fs})$ to $\pm(0.8 \text{ dB} + 1.0\% \text{ fs})$ depending on power range and frequency

Stability: <1 nanowatt/hour at 25°C

Temperature Effect: 0.007 dB/°C typ.

Indicator: 4½ inch taut band meter calibrated power and dBm.

Remote Control: Input range and manual disable commanded by TTL inputs.

DC Output: 10 V fs proportional to power.

Major Options: Meter scale and dc output linear with dBm. Rear input.

Analog Battery Model 42BB

Specifications same as 42B. Sealed lead-acid rechargeable 6 hour battery.

SPECIFICATIONS (Higher Power Versions)

Models: 42C Analog, 42CB Analog/Battery, 42CD Digital.

Power Ranges: 100 nW fs to 100 mW fs.

VSWR: <1.07 at 200 kHz, <1.28 at 18 GHz.

Stability: drift <10 nW/hour at 25°C.

All other specifications are the same as the Standard Versions.

POWER DETECTORS

200 kHz — 7 GHz, 50 Ω , -60 to +10 dBm.	41-4A
200 kHz — 12.4 GHz, 50 Ω , -60 to +10 dBm.	41-4B
200 kHz — 1 GHz, 75 Ω , -60 to +10 dBm.	41-4C
200 kHz — 18 GHz, 50 Ω , -60 to +10 dBm.	41-4E
200 kHz — 12.4 GHz, 50 Ω , -50 to +20 dBm.	41-5B*
200 kHz — 18 GHz, 50 Ω , -50 to +20 dBm.	41-5E*

*For use with 42C series only.

Down Scale Increments: 0 to -9 dB, 1 dB steps

Calibration Uncertainty: $<\pm 0.05 \text{ dB}$
(at 25°C)

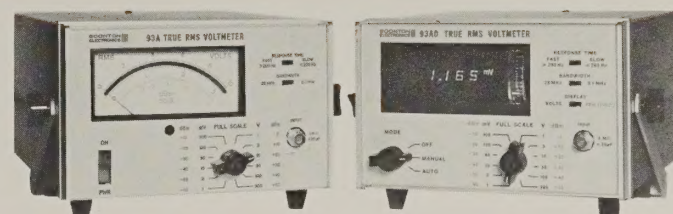
Harmonic Distortion: <0.15%

Temperature Influence: +0.005 dB/°C
(0 - 50°C)

Output Frequency: 1 MHz, xtal controlled

Output Impedance: 50 Ω

True RMS Voltmeters Model 93 Series



The Boonton 93A and 93AD voltmeters are true rms responding instruments that use backward diodes as balanced, low-level, square-law detectors. Both cover twelve ac voltage ranges from 1 mV to 300 V full-scale. The 1 mV full-scale range provides unmatched sensitivity to measure the low rms level of noise and of low duty cycle pulse trains. Both rms voltmeters feature a full 10 Hz to 20 MHz frequency range usable down to the lowest voltage range. A 3 dB bandwidth of 30 MHz assures accurate rms measurements of complex voltages with significant high frequency energy components, such as narrow pulses and wideband noise. The 93A meter is calibrated with dBm as well as voltage scales. The 93AD has an edge-mounted dBm analog meter in addition to the digital display; an optional dB display provides readings directly in dB with 0.01 dB resolution. Autoranging is also available.

Data Bus

The Model 93AD may be adapted to the IEEE-488 Standard Data Bus by use of the Model 10A-05 Bus Interface Unit (see this catalog).

SPECIFICATIONS

Analog Model 93A

Voltage Range: 1 mV to 300 V fs, in 12 ranges.

dBm Range: -68 dBm to +52 dBm (600 Ω ref.).

Selectable Bandwidth: 10 Hz to 20 MHz or 10 Hz to 100 kHz

Basic Accuracy: $\pm 1\% \text{ fs}$ or $\pm 2\% \text{ rdg}$, whichever is better.

Indicator: 4½" taut-band meter: scales 0-3, 0-10 and dBm.

Response Time: Fast; 1 sec. Slow; 4 sec.

Crest Factor: 6 at full scale; 18 at down scale.

Input: Impedance: 2 M Ω , < 25 pF.

Equivalent noise: < 35 μV .

DC Output: +10 V for fs.

Remote Control: All functions and ranges commanded with TTL input.

Options: Rear Signal input; 50 Ω dBm reference; 75 Ω dBm reference

Accessory: 93-1A, High-Z probe; 10 M Ω , < 11.5 pF, attenuation 10x.

Digital Model 93AD

Voltage Range: 1 mV to 300 V rms fs, in 12 ranges.

dB Range: 120 dB; resolution, 0.01 dB (optional).

Selectable Bandwidth: 10 Hz to 20 MHz or 10 Hz to 100 kHz

Basic Accuracy: $\pm(1\% \text{ rdg} + 1 \text{ count})$ for voltage.

$\pm 0.2 \text{ dB}$ for dB option.

Display: 3½ digit LED display (4 digits for dBm), Decimal point, units (V, mV, dB), under- and over-range, polarity (dBm only) also indicated. Analog edgometer, scaled over 12 dB range.

Response Time: Fast; 1 sec. Slow; 4 sec.

Crest Factor: 6 at full scale; 18 at down scale.

Input: Impedance: 1 M Ω , < 25 pF.

Equivalent noise: < 35 μV .

Outputs: BCD (serial) digits, binary range and mode information.

DC Output: 10 V for fs.

Remote Control: All functions and ranges commanded with TTL input.

Options: Autoranging; Rear signal input; 50 Ω dBm display; 75 Ω dBm display; 600 Ω dBm display; BCD serial/parallel converter

Accessory: 93-1A High-Z probe; 10 M Ω , < 11.5 pF,

Power Meter Calibrator Model 25A



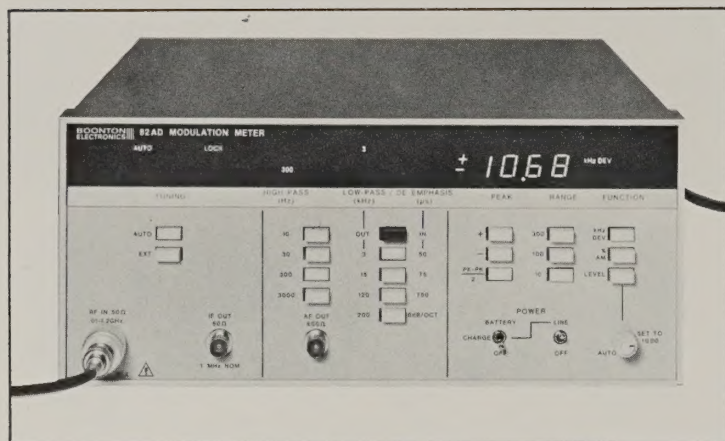
Provides full scale and incremental signal levels required for calibration of all Boonton Power Meters.

Dynamic Range: -69 to +20 dBm

Full Scale Functions: -60, -50, -40, -30, -20, -10, 0, +10, +20

FM/AM Modulation Meter 10 MHz to 1.2 GHz

Model 82AD



The Model 82AD FM and AM Modulation Meter combines automatic tuning and leveling with very high accuracy. In addition, it offers the advantages of digital display and an optional IEEE-488 bus interface. Battery operation is also available.

AUTOMATIC OPERATION

In operation, the highest amplitude RF carrier in the frequency range from 10 MHz to 1.2 GHz is automatically acquired and normalized in level to produce a 1 MHz IF replica of the RF modulated carrier. After demodulation the recovered audio is filtered, measured and digitally displayed in terms of modulation depth or carrier deviation.

DETECTORS

Keys select display of positive or negative peak modulation or peak average each in three ranges for both FM and AM. Detection is true peak at all levels with low distortion.

AUDIO FILTERS

Four high pass and four low pass filters plus four de-emphasis networks provide the means for bandpass simulation of most communication systems. The 6 dB/octave position relates phase deviation to the frequency deviation displayed.

ACCURACY AND RESOLUTION

The 4-digit display of the Model 82AD provides excellent accuracy and resolution. FM accuracy is 2% of reading at rates from 30 Hz to 100 kHz. AM accuracy is 2% of reading from 10% to 90% AM, and 5% of reading below 10% and above 90%; rates from 30 Hz to 100 kHz. Resolution for either FM or AM is 0.1% of full scale.

The AM calibration of each 82AD provides the especially accurate readings needed to test ILS transmitters to FAA requirements.

BUS INTERFACE

The field-installable, plug-in IEEE-488 bus interface option provides completely interactive programming by either the bus controller or the 82AD panel controls. Lighted annunciators display all range and status information.

BATTERY OPERATION

An optional rechargeable battery pack attaches to the rear of the 82AD bringing high accuracy measurements into the field environment.

SPECIFICATIONS

RF INPUT

Frequency Range: 10 MHz — 1.2 GHz

Sensitivity: 10 mV rms, 10 MHz - 520 MHz
30 mV rms, 520 MHz - 1.2 GHz

Tuning Acquisition Time: 100 ms at 100 MHz typical

Level Acquisition Time: 2 s typical

FREQUENCY MODULATION

Deviation Ranges: 10, 100, 300 kHz fs peak

Deviation Accuracy: $\pm 2\%$ of reading ± 1 digit

Rates: 30 Hz to 100 kHz

Residual FM: < 15 Hz rms at 100 MHz (30 Hz to 15 kHz BW)

AM Rejection: < 100 Hz deviation at 50% AM (1 kHz rate)

Stereo Separation: > 46 dB ; 200 Hz — 15 kHz BW, (to 50 Hz with external LO)

Distortion: $< 0.1\%$ THD for ± 100 kHz dev.

AMPLITUDE MODULATION

Depth Ranges: 10%, 100% fs

Accuracy: $\pm 2\%$ of reading ± 1 digit, 10% to 90% AM

$\pm 5\%$ of reading below 10% and above 90% AM

Rates: 30 Hz to 100 kHz

Residual AM: $< 0.05\%$ AM rms for input levels above 100 mV rms (RF < 520 MHz, 30 Hz — 15 kHz BW)

FM Rejection: $< 0.5\%$ AM at ± 50 kHz deviation (< 100 kHz rate)

Distortion: $< 0.2\%$ THD for 30% AM

AVIONICS:

Depth Accuracy: $\pm 0.7\%$ of reading at 20, 30, and 40% AM, f mod. 30 Hz — 3 kHz (Filter, 10 Hz — 15 kHz)

Detector Flatness: Indicated AM for constant % AM between 20 and 40% and f mod. of 90 and 150 Hz will be within $\pm 0.4\%$

AUDIO FREQUENCY RESPONSE

Filters:	High Pass	Low Pass	De-emphasis
	< 10 Hz	3 kHz	50 μ S
	30 Hz	15 kHz	75 μ S
	300 Hz	120 kHz	750 μ S
	3 kHz	200 kHz	6 dB/Oct (ref. 1 kHz)

Shape Factor: All filters are three-pole Butterworth except 10 Hz and 200 kHz. De-emphasis time constant and 3 dB filter frequencies have an accuracy of $\pm 4\%$ (except 10 Hz).

DISPLAY

Modulation: 4 digit LED display; 1000 counts + 100% overrange; + peak, — peak, or peak average indication.

Annunciators: All panel functions plus level, lock, overrange, battery low, remote.

OUTPUTS

Audio: 1 V/600 Ω at 1000 counts

IF: 1 MHz, 0 dBm 50 Ω

DC: 1 V, 1000 counts, 1000 Ω source

OPTIONS

-01 IEEE 488 Bus Interface

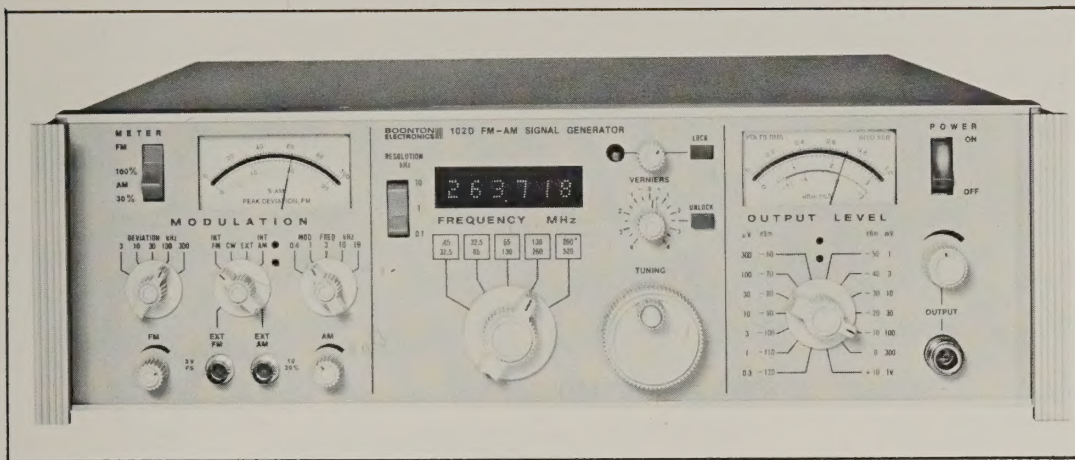
-02 Battery power supply

-03 RF fuse

-04 Rear panel RF input

FM-AM Signal Generators 450 kHz to 520 MHz

Models 102C and 102D



Model 102C/D Signal Generators have a combination of performance characteristics at a reasonable price that make them widely accepted for IF and RF performance tests on receivers used in mobile, telemetry, avionics, broadcast and industrial applications.

They have these important advantages:

- Frequency displayed on digital counter with accuracy and resolution needed for narrow-band work
- Phase locked stability referenced to internal TCXO (102D)
- Low Distortion FM and AM true peak monitored on separate meter
- Full wide deviation FM on all RF bands
- Special versions for applications not covered by standard model
- Control grouping that makes generator easy to understand and use

FREQUENCY

The six-digit LED display has selectable resolutions down to 100 Hz. The zero backlash, adjustable-friction controls give velvet smooth tuning to take full advantage of this resolution. Unusually good unlocked stability minimizes the need to retune.

PHASE LOCK (102D only)

The 102D output frequency may be phase locked to an internal reference temperature compensated crystal oscillator. To lock the generator, the desired frequency is set and a lock button depressed. Fine tuning is accomplished by a "lock vernier" control. An important feature is that the true frequency is displayed at all times even when tuning between lock points with the "lock vernier". This is because the lock reference and display time base reference are separate oscillators.

MODULATION

Five internal modulation frequencies plus external are standard; up to nine are optionally available.

FM deviation is up to ± 300 kHz on all ranges with a bandwidth to 200 kHz. Even wider deviations to ± 1 MHz are possible with an external input. Metering accuracy is 10% fs, true peak responding. AM ranges are 30% and 100% fs with bandwidth to 20 kHz.

RF OUTPUT

Output level is switched in 13 steps of 10 dB. A variable output control in conjunction with the RF output meter allows settings between each step for a total range of -130 dBm to +13 dBm.

OPTIONS

Rf output on rear, special modulation frequencies, detected AM output, fused RF output, external clock input, avionics options, high Z modulation inputs, 75 Ω RF output, frequency doubler, low distortion FM, and others.

SPECIFICATIONS

FREQUENCY

Range: 450 kHz to 520 MHz in 5 bands

Accuracy: $\pm$ (resolution + 1 ppm), 15°C to 35°C (102D)
 $\pm$ (resolution + 5 ppm), 15°C to 35°C (102C)

Resolution: Selectable 100 Hz, 1 kHz, 10 kHz

Stability: Phase locked (102D)

32-520 MHz, <0.2 ppm/hr after 1 hour;

<0.05 ppm/hr after 4 hours

0.45-32 MHz, <100 Hz/hr after 1 hour

Unlocked, (102C & 102D)

32-520 MHz, 10 ppm/10 min. after 2 hours

0.45-32 MHz, <1.5 kHz/10 min. after 1 hour

RF OUTPUT

Power Level: -130 dBm to +13 dBm (0.07 μ V to 1 V into 50 ohms)

Attenuator: 13 steps, 10 dB/step plus variable 13 dB calibrated on output meter

Accuracy: $\pm$ (1.0 dB + 0.1 dB/10 dB step) (1.0 dB cumulative step error max.)

Leveling: $\pm$ 0.5 dB max. variation across each band

Impedance: 50 ohms, VSWR <1.5:1 at levels below 0 dBm

SSB Total Noise: (at 20 kHz offset from carrier in 1 Hz bandwidth),
 450 kHz - 130 MHz, 130 dB below carrier
 130 - 260 MHz, 124 dB below carrier
 260 - 520 MHz, 118 dB below carrier

FREQUENCY MODULATION

Maximum Deviation: ± 300 kHz peak; ($> \pm 1$ MHz peak, uncalibrated), all bands

Ranges: 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, peak fs

Accuracy: $\pm 10\%$ fs, 20 Hz to 200 kHz

Bandwidth (unlocked): DC to 200 kHz

Bandwidth (locked): 50 Hz to 200 kHz (102D only)

Distortion: For 100 kHz dev., THD is 1.0% at 450 kHz reducing to 0.15% at 520 MHz. (-19 option: for 75 kHz dev., THD is 0.05% 76-108 MHz.)

Stereo Channel Separation: >46 dB, 50 Hz to 15 kHz rates

AMPLITUDE MODULATION

Ranges: 30%, 100% fs

Accuracy: 1% AM +6% rdg up to 90% AM

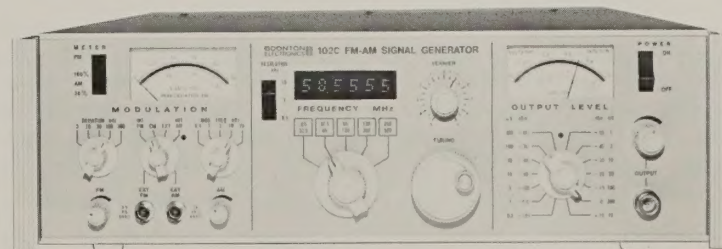
Bandwidth: DC to 20 kHz

Distortion: <1% THD at 30% AM
 <2% THD at 70% AM
 <3% THD at 90% AM } 1 kHz rate

INTERNAL MODULATION OSCILLATOR

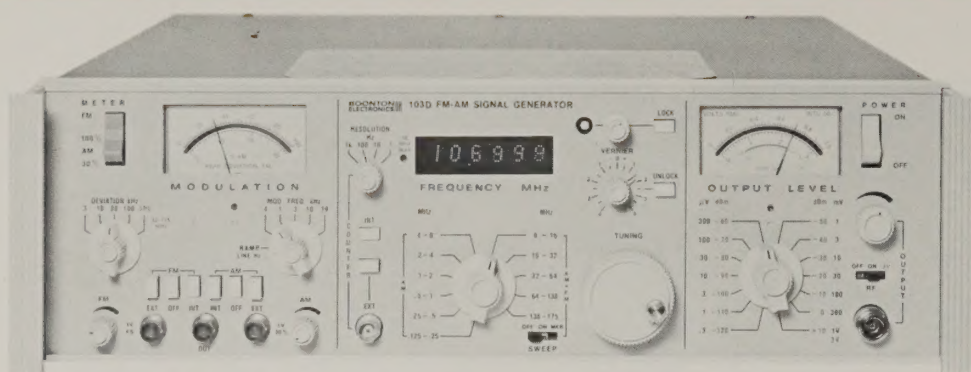
Frequencies: 400 Hz, 1 kHz, 3 kHz, 10 kHz, 19 kHz

Distortion: <0.2% THD



FM/AM Signal Generators 125 kHz to 175 MHz

Models 103C and 103D



The 103C/D Signal Generators cover applications in design, production and maintenance of receivers and systems in the entertainment and communications fields.

They have these important advantages:

- High resolution and accuracy provided by the digital frequency display.

- Phase-lock stability referenced to internal TCXO (103D).

- High quality, versatile FM and AM, peak monitored on separate meter.

- Wide output range -130 dBm to +23 dBm (3 V).

- Five sweep ranges with digital readout of sweep center-frequency and the frequency of a variable intensity marker on the 10.7 MHz and 98 MHz ranges.

- External count capability to the full accuracy and resolution of the frequency display.

FREQUENCY

The six-digit LED display has selectable resolutions down to 1 Hz below 16 MHz RF (10 Hz resolution above 16 MHz). The zero backlash, adjustable-friction controls give velvet smooth tuning to take full advantage of this resolution. Unusually good unlocked stability minimizes the need to retune.

PHASE-LOCK (103D only)

The 103D output frequency may be phase locked to an internal reference temperature compensated crystal oscillator. To lock the generator, the desired frequency is set and a lock button depressed. Fine tuning is accomplished by a "lock vernier" control. An important feature is that the true frequency is displayed at all times even when tuning between lock points with the "lock vernier". This is because the lock reference and display time base reference are separate oscillators.

MODULATION

Five internal sinewave modulation frequencies, external, and a line frequency ramp for sweep operation are standard. Other frequencies in the range of 20 Hz to 100 kHz may be optionally provided.

FM deviation is up to 100 kHz from 8 to 32 MHz, and 300 kHz above 32 MHz. Unlocked bandwidth is dc to 200 kHz.

Full-scale AM ranges of 30% and 100% are provided. Bandwidth is dc to 20 kHz above 1 MHz. A rear-panel demodulated AM output is provided. Meter is true peak indicating for both FM & AM.

FREQUENCY SWEEP

There are five sweep ranges. The 10.7 MHz and 98 MHz center frequency sweeps are provided with a variable frequency intensity marker. Both the sweep center frequency and marker frequency may be read off the counter display. Sweep width is adjustable and read on the modulation meter. Sweep output is via the RF output connector, and it is monitored, leveled and adjusted in the same way as the normal RF output of the generator.

RF AND SWEEP OUTPUT

The output level is switched in 13 steps of 10 dB. Settings between these steps are made using the variable control and are read on the output meter.

The RF output can be switched off by a front panel slide switch. This same switch can also be used to obtain a special high level metered output to +23 dBm (3 V into 50 Ω). Total range is -130 dBm to +23 dBm.

OPTIONS

Rear RF output connector; special modulation frequencies; fused rf output; high-Z modulation inputs; external clock input; 75 μ S pre-emphasis in FM channel; special sweep ranges; 75 Ω RF output; CB modulation meter markings; FM on band 6 (30 kHz maximum); 5 Ω output impedance transformer, low distortion FM.

SPECIFICATIONS

FREQUENCY

RF Range: 125 kHz to 175 MHz in 11 bands.

Resolution: Selectable: 1 Hz (<16 MHz RF), 10 Hz, 100 Hz, 1 kHz

Accuracy: $\pm$ (resolution + 1 ppm) 15 — 35°C

Stability: 10 ppm/10 min. after 2 hr. In phase-locked mode <0.05 ppm/hr. after 4 hrs., 0.2 ppm/hr. after 1 hr. (103D only)

FREQUENCY SWEEP

Ranges:	f_0	Max. sweep width
	262 kHz	± 30 kHz
	455 kHz	± 30 kHz
	1.2 MHz	± 100 kHz
	10.7 MHz	± 1 MHz*
	98 MHz	± 10 MHz*

*Ranges with intensity marker

Drive: Internal: 50 - 60 Hz ramp (line synchronized)

External: 10 Hz to 1 kHz rates

Marker Pulse: +4V, 60 μ S

EXTERNAL COUNTER

Frequency Range: 5 Hz to 175 MHz

Sensitivity: >100 mV

Reference Accuracy: < ± 1 ppm, 15°C to 35°C

FREQUENCY MODULATION

Max. Deviation: Bands 9-11 (32-175 MHz), ± 300 kHz peak
Bands 7-8 (8-32 MHz), ± 100 kHz peak

Ranges: 3, 10, 30, 100, 300 kHz

Accuracy: $\pm 7\%$ fs

Bandwidth: Unlocked, DC to 200 kHz

Locked, 50 Hz to 200 kHz (103D only)

Distortion:

Band	THD at 100 kHz Dev.	THD at 75 kHz Dev.
8-16 MHz	2.0%	
16-32 MHz	1.0	
32-64 MHz	0.5	
64-138 MHz	0.3	0.2% 76-108MHz*
138-175 MHz	0.5	*0.05% opt. -19

Stereo Channel Separation: >46dB (50 Hz to 15 kHz rates)

AMPLITUDE MODULATION

Ranges: 30% AM, 100% AM fs

Accuracy: $\pm(1\%$ AM + 7% rdg.) to 80% AM at 1 kHz rate

Bandwidth: DC to 20 kHz (1 to 175 MHz)

DC to 10 kHz (250 kHz to 1 MHz)

DC to 5 kHz (125 to 250 kHz)

Distortion: <1% THD at 30% AM, 1 kHz rate

INTERNAL MODULATION OSCILLATOR

Frequencies: Sine: 400 Hz, 1 kHz, 3 kHz, 10 kHz, and 19 kHz

Ramp 50 - 60 Hz (line synchronized)

Sinewave distortion: <0.2% THD

RF AND SWEEP OUTPUT

Level (normal): -130 dBm to +13 dBm (0.07 μ V to 1 V into 50 Ω)

Level (high): To +23 dBm (3V) all bands (Restricted AM above +20 dBm)

Attenuator: 13 steps of 10 dB/step + variable 13 dB calibrated on output meter

Accuracy: $\pm(1$ dB* + 0.1 dB/10 dB step) *1.5 dB, band 1
(Max. cumulative step error 1 dB)

Leveling: ± 0.5 dB max. variation across each band

Impedance: 50 Ω , VSWR <1.3 below 0 dBm

RF Interrupt: >50 dB isolation (at 0 dB on output meter)

SSB Total Noise: 125 dB below carrier at 20 kHz offset
(1 Hz bandwidth)

Automatic 1 MHz Capacitance Bridge Model 76A



The Model 76A combines established precision bridge techniques with an automatic balancing system and internal computing facilities. It makes fully automatic, triggered or free running, 1 MHz parallel capacitance and conductance measurements with test levels of from 5 to 200 mV rms. Independent range selection or autoranging for both capacitance and loss is made using the convenient front-panel push-button controls. Annunciators show the range or mode in use.

The bridge will compute and display on command the equivalent series capacitance, series resistance, dissipation ($\tan \delta$), or Q of the test. In addition, any capacitance measurement can be displayed as a deviation in capacitance or a percentage deviation versus a previously entered and stored value.

The push button controls have a secondary function when the "entry" mode is selected. In this mode they may be used to program numbers which appear in the right hand display. These numbers may be entered into storage as a reference capacitance value for deviation measurements or entered to set a dc bias voltage on the optional internal supply.

A unique "corrected zero" feature of the 76A supplements the front panel coarse and fine C & G zero controls. In this mode the zero offsets of every combination of C & G range are automatically measured and stored for correction of subsequent readings.

Measurements may be made at the front panel test inputs or at the end of shielded test leads. When "remote test point" is selected a stored program is used to calculate and correct for each measurement made through the 30 inch test cables supplied.

Versatile remote control input and data output options are available.

SPECIFICATIONS

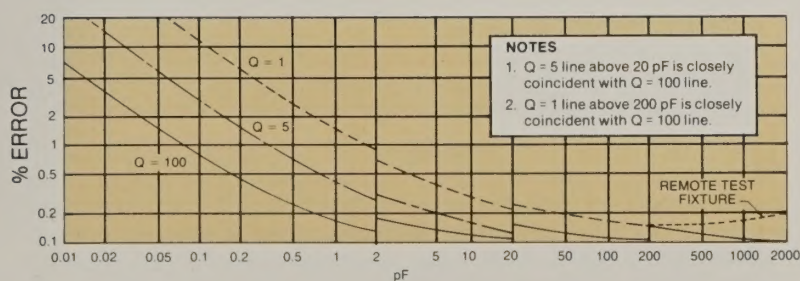
Capacitance: 0-2000 pF in 4 ranges;

0-1.9900 pF, 0-19.900 pF, 0-199.00 pF, 0-1990.0 pF

Capacitance Accuracy:

$$C \text{ error, (pF)} < \pm \left[\frac{C(\text{pF})}{1000} + \frac{g(\mu\text{S})}{20000} + \frac{C \text{ fs(pF)}}{20000} + 0.0005 \left(\frac{1 + 10D}{1 + D} \right)^2 + \frac{0.02}{e} \right]$$

where e = test level in mV



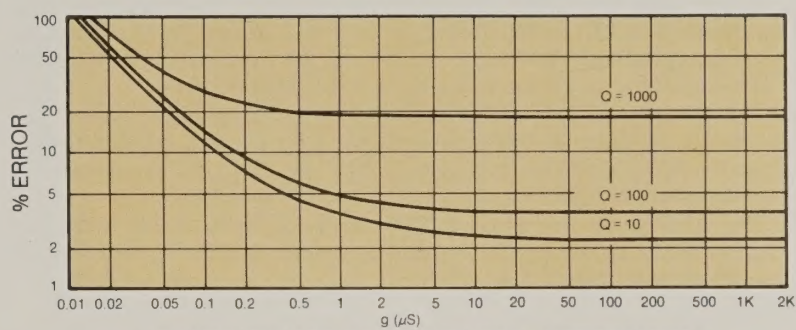
CAPACITANCE ACCURACY (200 mV TEST LEVEL)

Conductance: 0-2000 μS in 4 ranges;
0-1.999 μS , 0-19.99 μS , 0-199.9 μS , 0-1999 μS

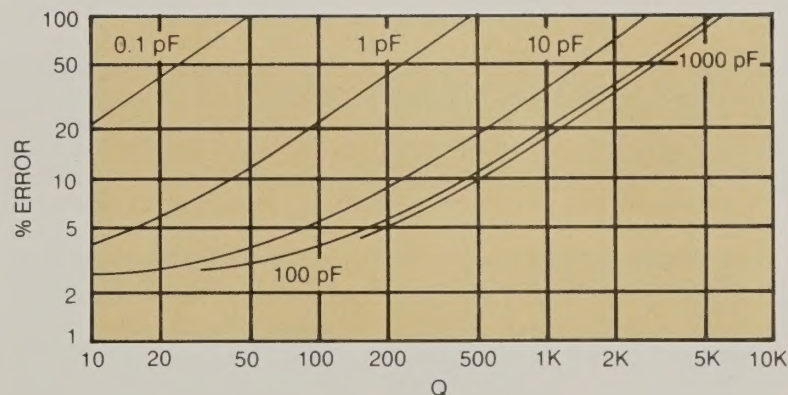
Conductance Accuracy:

$$g \text{ error, } (\mu\text{S}) < \pm \left[\frac{g(\mu\text{S})}{50} + \frac{C(\text{pF})}{1000} + \frac{g \text{ fs}(\mu\text{S})}{2000} + 0.001 \left(\frac{1 + 10Q}{1 + Q} \right) + \frac{0.2}{e} \right]$$

where e = test level in mV



CONDUCTANCE ACCURACY (200 mV TEST LEVEL)



CONDUCTANCE ACCURACY
IN THE PRESENCE OF CAPACITANCE

Test Signal: 1 MHz, 5-200 mV, variable

Test Time: 100 — 150 ms, $C > 2 \text{ pF}$ and $G > 2 \mu\text{S}$.
500 ms, $C < 2 \text{ pF}$ or $G < 2 \mu\text{S}$.

Display: Dual digital readout, decimal points, units, modes, active ranges.

Display Modes: C_p , C_s , ΔC , $\Delta\%$, G , R_p , R_s , D ($\tan \delta$), Q .

Autoranging Speed: 5 ms each range change.

Trigger Modes: Continuous (1 per sec), manual, external.

DC Bias: External input, $\pm 200 \text{ V}$, 30 mA fused.

Supplied Accessories: Universal test fixture with 30" input cables.

Options:

- 01 IEEE 488-1975 Interface Bus.*
- 02 Parallel BCD Data Outputs, TTL isolated*
- 03 Programmable DC Bias

Range: 0 to 200 volts, unipolar, 5 mA max.

Resolution: 5 mV for bias to 20 volts

50 mV for bias from 20 to 200 volts

Programming: Entered numerically from panel

or externally programmed.

Accuracy: 0.05% of setting + resolution

- 04 RS-232C Interface*

* Only one option may be installed at the same time

Capacitance Sorting Module Model 76-7A



The 76-7A Sorting Module operates in conjunction with the Model 76A Automatic Capacitance Bridge. It compares the capacitance and loss measurement results of the 76A to manually pre-programmed tolerance values in order to provide a category decision for capacitance and a limit decision for loss.

Lamps indicate capacitance category and loss-limit accept for manual sorting of capacitors. Electrical decision outputs (logic and relay) provide the means for interface to mechanical component handlers.

The sorting module is supplied with a special interface card for installation in the 76A Automatic Capacitance Bridge and a set of interconnecting cables.

SPECIFICATIONS

Nominal Capacitance: 2.0000 pF to 2000.0 pF in 4 fs ranges.

Capacitance Limits: 7 "GO" zones and 2 reject "HI" and "LO" zones. Each limit set by 4 digit thumbwheel switch with range of $\pm 99.99\%$ and resolution of 0.01%.

D Limit (Q Limit): $D = .0000$ ($Q = 9999$.) to $D = .9999$ ($Q = .9999$).

Test Indicators: Lamps indicate 7 capacitance zone accepts, low C, high C, D/Q reject, test complete, and program error.

Logic Outputs: Duplicate Test Indicators. TTL-compatible and low-true.

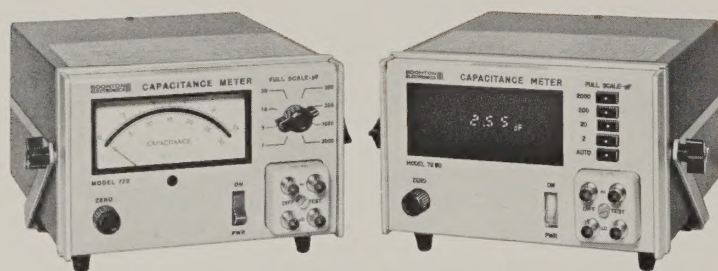
Relay Outputs: Duplicate Test Indicators. Rated 2A peak, 500 V peak, 100 VA peak.

System Response: 120 to 170 ms (520 ms if either 2 pF fs or $2\mu\text{S}$ fs ranges are selected on Model 76A) consisting of 76A measurement time and 20 ms 76-7A classification time.

System Accuracy: Same as Model 76A if used alone.

System Trigger: Remote contact closure or TTL low, front panel push button, or free running in unison with 76A.

Capacitance Meters 1 MHz Model 72 Series



The Model 72 Series of capacitance meters provide rapid, accurate, three-terminal measurements of capacitance, particularly of semiconductor devices because of the low test level employed (15 mV rms) and the provision for application of dc bias to the test.

The phase-sensitive detection system allows the capacitance of even low Q devices (as low as $Q = 1$) to be measured with little reduction in accuracy. Range switching is accomplished by a combination of logic-controlled reed relays and diodes. Range selection is by front panel switch or remote TTL inputs.

Both models provide a highly linear, high-speed, dc analog voltage. Output corresponding to the meter or display indication. In addition, the 72BD has BCD outputs, TTL compatible. Autoranging of this model is standard.

Adapters are supplied for coaxial-cable connection to a remote test fixture, and for direct attachment of wire-leaded components.

Data Bus

The model 72BD may be adapted to the IEEE-488 Standard Data Bus by use of the Model 10A-03 Bus Interface Unit (see this catalog).

SPECIFICATIONS

Digital Model 72BD

Capacitance Ranges: 2.000, 20.00, 200.0, 2000 pF fs.

Basic Accuracy: $\pm(0.25\% \text{ rdg} + 0.2\% \text{ fs})$.

Display: LED-type, 4 digits.

Data Outputs: Serial by digit, TTL.

Commands: Range (4 lines); manual disable; autorange enable; encode hold, encode trigger; TTL.

DC Output: 2 V for fs all ranges; linearity $\pm(0.1\% \text{ rdg} + 0.005\% \text{ fs})$.

Response Time: $< 2 \text{ ms}$

Test Signal: 1 MHz, 15 mV rms.

DC Bias: External $\pm 600 \text{ V max.}$

Autoranging: Standard, 100 ms per range.

Options: 100 mV test level, BCD serial/parallel converter.

Analog Model 72B

Capacitance Ranges: 1, 3, 10, 30, 100, 300, 1000, 3000 pF fs.

Basic Accuracy: $\pm(0.5\% \text{ rdg} + 0.5\% \text{ fs})$.

Resolution: 0.5% fs for each range.

Meter: $4\frac{1}{2}$ inch taut-band type.

Commands: Range (8 lines); manual disable; TTL.

DC Output: 1 V for fs (1 series ranges); 3 V for fs (3 series ranges); linearity, $\pm(0.1\% \text{ rdg} + 0.01\% \text{ fs})$

Response Time: $< 1 \text{ ms.}$

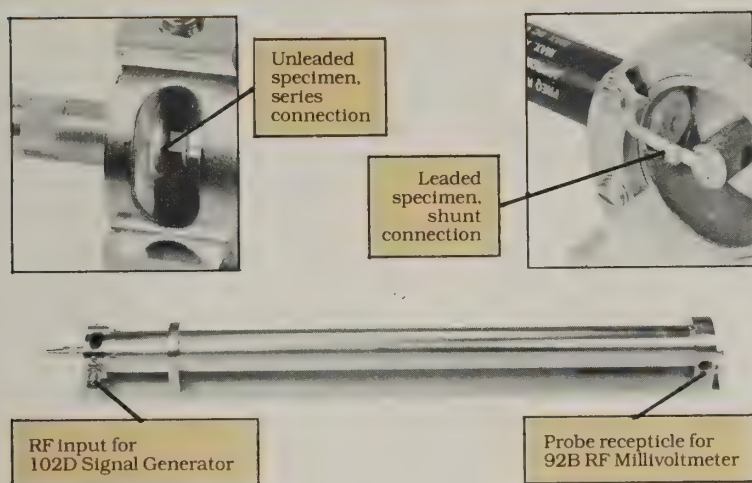
Test Signal: 1 MHz, 15 mV rms.

DC Bias: External $\pm 600 \text{ V max.}$

Option: 100 mV test level.

Resonant Coaxial-Line For Q Measurement

Model 34A



The Boonton Model 34A Resonant Coaxial-Line, when coupled to a Model 102D Signal Generator and a Model 92B RF Millivoltmeter, provides an accurate high frequency system for measuring the effective series resistance (esr), effective capacitance, and Q factor of both leaded and unleaded capacitors.

THEORY

A resonant, coaxial transmission-line, short-circuited at one end and open-circuited at the other, whose fundamental resonant frequency and Q-factor are known, is perturbed with a test component, connected either in series at the short-circuited end of the line, or in shunt at the open-circuited end of the line.

The addition of the component to the line alters the resonant frequency of the system, and the combined Q-factor of the test component and the line is measured using the Δf technique at the newly established resonant frequency. This Q-factor and the parameters of the resonant line, applied in the proper equation, will yield the esr and Q-factor of the test element, as well as the effective capacitance.

COMPONENT CONNECTION

Unleaded chip capacitors are connected in series with the line. Leaded components can also be connected in series with the line and the influence of the leads can be eliminated by swallowing the leads in slots provided in the line (34A-01 version).

Leaded components can alternatively be connected at the open-circuited end of the line to include the effect of the resistance and inductance of the leads.

Special fixtures for radial leaded capacitors and variable piston capacitors are available (see accessories).

ACCURACY AND REPEATABILITY

Error analysis supports absolute accuracy claims of $\pm 10\%$ at $Q = 100$ to $\pm 30\%$ at $Q = 10,000$, however, measurements of Q-factors over 1000 may be repeated on a day-to-day basis within a few percent.

SPECIFICATIONS

Range*:

Series mode: 1.0 pF to >1000 pF from 130 to 1250 MHz**

Shunt mode: 0 to 200 pF from 25 to 130 MHz

0 to 100 pF from 265 to 390 MHz

0 to 30 pF from 530 to 650 MHz**

Maximum values of capacitance shown are not absolute limits. No capacitance limit when measuring ESR only.

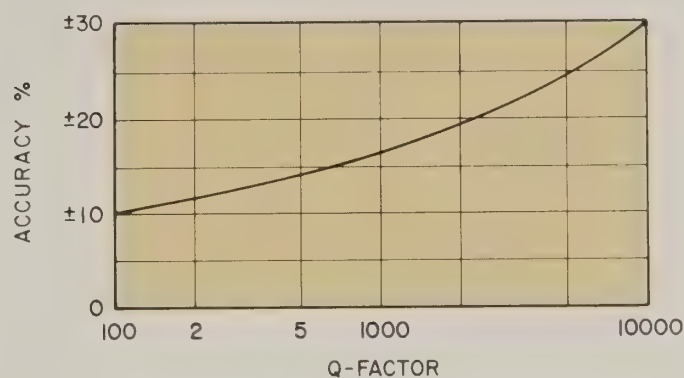
Test Level:

Series mode: Approximately 5 mA or less

Shunt mode: Approximately 0.4 Volt, or less

Accuracy***:

Generally within $\pm(5 + Q^{0.35})\%$



*Capacitance and frequency are interdependent

**Use Boonton 102-1A Frequency Doubler and 34-1A Probe above 520 MHz

***Certification not presently available from NBS

Overall length: 24.2 inches (6.15 cm)

Width: 2 inches (5.1 cm)

Height: 2 inches (5.1 cm)

Maximum component body length for series measurements: 0.3 inch (7.6 mm)

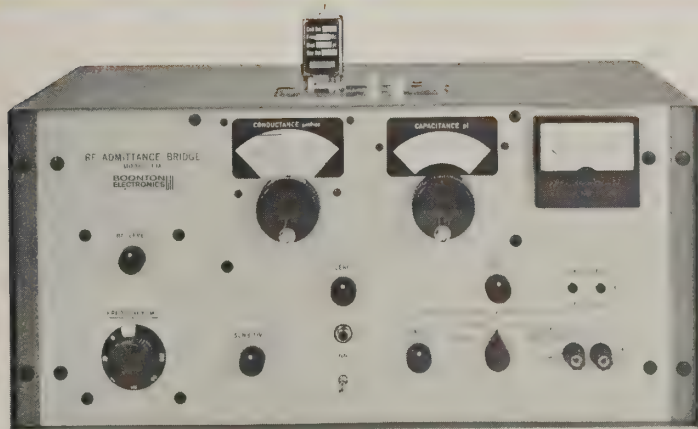
Maximum component lead length that can be swallowed for a series measurement: 1 inch (2.54 cm) each lead (34A-01)

Spacing of contacting clamps for shunt measurements: 0.6 inch (1.52 cm)

Minimum component lead length for a shunt measurement: Approximately 0.7 inch (1.78 cm)

RF Admittance Bridges 1 MHz to 100 MHz

Model 33 Series



These bridges measure two-terminal parallel capacitance and conductance at 1, 5, 10, 20, 30, 50, and 100 MHz. Other frequencies between 1 and 100 MHz can be provided to special order. Good resolution of low conductance values makes loss measurements possible on many high Q diodes, varactors, and capacitors. The bridge balances accurately with the low test levels required for measurements on most solid state devices. Internal and external dc bias is standard.

SPECIFICATIONS

Model 33A/1

Capacitance: 0-150 pF (30 pF at 100 MHz); resolution, 0.02 pF; basic accuracy, $\pm 0.3\%$.

Conductance: 0-25 mS; resolution, 0.5 μ S or better; basic accuracy, $\pm 2\%$.

Model 33B/1

Capacitance: 0-150 pF (30 pF at 100 MHz); resolution, 0.02 pF; basic accuracy, $\pm 0.3\%$.

Conductance: 0-5 mS; resolution, 0.1 μ S or better; basic accuracy, $\pm 2\%$.

Model 33C/1

Capacitance: 0-15 pF; resolution, 0.002 pF; basic accuracy, $\pm 1\%$.

Conductance: 0-25 mS; resolution, 0.5 μ S or better; basic accuracy, $\pm 2\%$.

Model 33D/1

Capacitance: 0-15 pF; resolution, 0.002 pF; basic accuracy, $\pm 1\%$.

Conductance: 0-5 mS; resolution, 0.1 μ S or better; basic accuracy, $\pm 2\%$.

Capacitance Bridge 1 MHz Model 75D



Model 75D measures 3-terminal parallel capacitance and conductance and allows remote connection without errors due

to stray capacitance to ground. An adapter for 2-terminal grounded measurements is available. Inductance is measured by conversion from equivalent capacitance reading.

The main capacitance dial consists of a "counter" dial that works in conjunction with a 40:1 vernier dial. This arrangement provides both ease of scanning and great accuracy of fine adjustment. A new 0.1 μS fs. Conductance range gives improved resolution for high Q measurements.

SPECIFICATIONS

Capacitance: 0 to 1000 pF; basic accuracy, $\pm 0.25\%$; resolution, 0.00005 pF max.

Capacitance Ranges: 0.1 pF, 1.0 pF, 10 pF, 100 pF and 1000 pF fs.

Conductance: 0 to 1000 μS ; basic accuracy $\pm 5\%$; resolution, 0.002 μS max.

Conductance Ranges: 0.1 μS , 1.0 μS , 10 μS , 100 μS and 1000 μS fs.

Inductance: 25 μH to 25 mH; basic accuracy, $\pm 0.25\%$.

Test Signal: 1 MHz; level adjustable from 1 mV to 250 mV.

Internal DC Bias: HI to LO; -6 to +150 V.

External DC Bias: ± 400 V max.

Inductance Meters 1 MHz Model 62 Series



The Model 62 Series inductance meters provide fast, accurate, two-terminal, series inductance measurements at 1 MHz with low test current. Both analog and digital models are programmable and have a linear, high-speed, dc analog output. Either instrument measures 1 MHz series inductance and ignores any loss component above series Q's of 5. Even if loss appears in parallel with the test specimen, the equivalent series inductance is displayed.

Both versions have linear dc outputs proportional to the displayed inductance. From a normal test open circuit condition dc output responds in less than 200 milliseconds. Autoranging adds another 100 mspcrange. From a short-circuited condition, the dc output responds in less than 1 millisecond.

Remote measurements can be made up to 30 inches from the front panel by using the optional 62-1A test fixture.

Data Bus

The Model 62AD may be adapted to the IEEE-488 Standard Data Bus by use of the Model 10A-02 Bus Interface Unit (see this catalog).

SPECIFICATIONS

Digital Model 62AD

Inductance Ranges: 2.000, 20.00, 200.0, 2000 μH fs

Basic Accuracy: $\pm(0.5\% \text{ rdg} + 0.2\% \text{ fs})$

Display: LED-type, 4 digits

Data Outputs: Serial by digit, TTL

Commands: Range (4 lines); manual disable; autorange enable; encode hold; encode trigger; TTL

DC Output: 2 V for fs all ranges

Test Signal: 1 MHz; level, 160 μA max.

Autoranging: Standard, 100 ms per range change.

Analog Model 62A

Inductance Ranges: 1, 3, 10, 30, 100, 300, 1000, 3000 μH fs

Basic Accuracy: $\pm(0.5\% \text{ rdg} + 0.5\% \text{ fs})$

Resolution: 0.5% fs all ranges

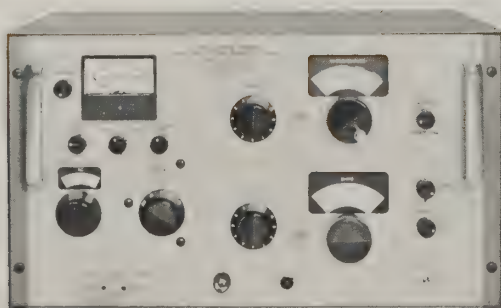
Meter: 4½ inch taut-band type

Commands: Range (8 lines); manual disable; TTL

DC Output: 1 V fs (1 series ranges); 3 V fs (3 series ranges)

Test Signal: 1 MHz; level, 160 μA max.

Inductance Bridges Model 63 Series



These unique bridges provide direct-reading measurements of series inductance down to unusually low values with fractional

percentage accuracy over broad frequency ranges. Series resistance is also directly measured. Each bridge is complete with built-in oscillator and detector. Test current does not change during balance.

SPECIFICATIONS

Model 63H

Inductance: 0.2 nH to 110 mH; basic accuracy $\pm 0.25\%$.

Series Resistance: 0.2 m Ω to 11 k Ω ; basic accuracy $\pm 3\%$.

Test Signal: Frequency, 5 to 500 kHz; level 3 V rms max.

Model 63L

Inductance: 20 nH to 11 H; basic accuracy $\pm 0.25\%$.

Series Resistance: 5 m Ω to 110 k Ω ; basic accuracy $\pm 3\%$.

Test Signal: Frequency, 0.4 to 40 kHz; level, 5.5 V rms max.

Model 63M

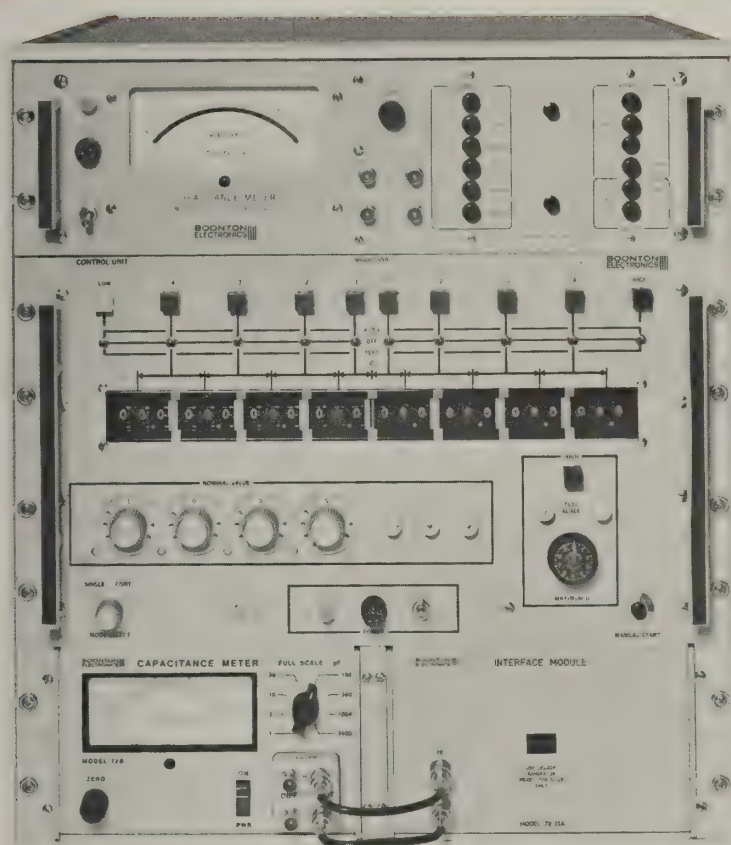
Inductance: 2 nH to 1.1 H; basic accuracy $\pm 0.25\%$.

Series Resistance: 2 m Ω to 110 k Ω ; basic accuracy $\pm 3\%$.

Test Signal: Frequency, 1 to 100 kHz; level, 5.5 V rms max.

Capacitance Sorting Systems

Model 170 Series



The 170 Series is designed to control component handling equipment for high-speed testing of capacitors.

The Series is based on two control units: one for high-accept-low limit testing, and one for up to eight accept zones plus high and low reject limits for multi-category sorting. Either control unit can be combined with a 1 kHz or 1 MHz capacitance measurement module to form a complete system.

MULTI-CATEGORY SORTING SYSTEM

Front panel switches are used to set up capacitance range and nominal value. A row of digit switches allow set up of 8 accept categories plus high and low reject categories in terms of % of nominal value. A dial potentiometer sets maximum D limit in two ranges (not operational for 1 MHz testing).

Mercury wetted relay switches issue decision outputs that are used to control sorting gates in an appropriate handler. These decisions are also displayed on colored panel lamps. The test cycle may be free running or triggered. Decision time is from 65 to 145 milliseconds depending upon category.

LIMIT TESTING SYSTEM

This similar system is arranged to provide a simple high-go-low sort of capacitance. Rotary switches provide setting for nominal value and upper and lower limits in terms of % of nominal, and a dial potentiometer sets the D limit in two ranges. Decision time is 45 milliseconds.

SPECIFICATIONS

	1 kHz Systems	1 MHz Systems
Nominal C Ranges:	99.99 pF fs to 9.999 μ F fs in 6 ranges	0.9999 pF fs to 999.9 pF fs in 4 ranges
C Tolerance Range:	0 to $\pm 99.9\%$ (limited to + 1.4% of fs)	0 to $\pm 99.9\%$
C Sorting: (170/5 Systems)	8 Accept zones with 4 independent plus and 4 independent minus limits. Also low and high reject.	
C Limit: (170/4 Systems)	1 Accept zone with independent plus and minus limits. Also low and high reject.	
DF Limit:	0 to 0.1 DF in 2 ranges (0.0005 DF resol.)	Not Applicable
Excitation:	1 V rms (0.5 V or 2.0 V optional)	100 mV rms
Accuracy:	C, generally 0.25% rdg. D, generally 2.0% rdg.	Generally, 0.35% rdg.

IEEE-488 Bus Interface Unit

Model 10A



The Model 10A IEEE-488 Bus Interface Unit allows all Boonton digital meter type instruments to be adapted for use on the bus. It allows the instrument to become either a talker or listener or both under the direction of a controller such as a bus interfaceable calculator.

The design employs a microprocessor that follows programs stored in a PROM. This PROM may easily be exchanged to adapt the bus interface unit to other Boonton meters. An option number designates the PROM installed.

Interface Functions:

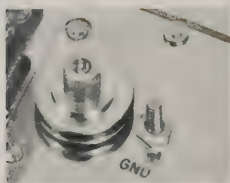
SH1	Source handshake capability
AH1	Acceptor handshake capability
T7	Talker (basic talker; no serial poll, talk only mode, unaddressed to talk if addressed to listen)
L3	Listener (basic listener, listen only mode, unaddressed to listen when addressed to talk)
SRO	No service request capability
RL1	Remote/Local Capability
PPO	No parallel poll capability
DC1	Device clear capability
DT1	Device trigger capability
CO	No controller capability

Model Selection:

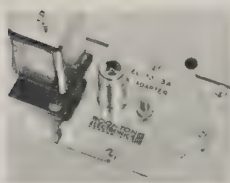
Option	Used With:
10A-01	Model 42BD Microwattmeter
10A-02	Model 62AD 1 MHz Inductance Meter
10A-03	Model 72BD 1 MHz Capacitance Meter
10A-04	Model 92BD RF Millivoltmeter
10A-05	Model 93AD True RMS Voltmeter
10A-06	Model 42CD Microwattmeter

Note: Model 10A-05 option requires a different cable between the 10A and 93AD.

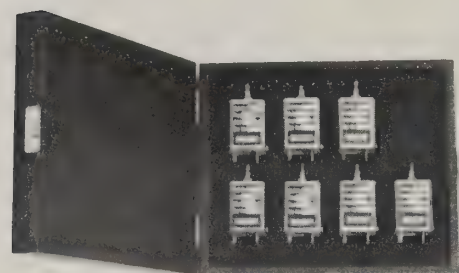
Accessories



33-1A Dielectric Sample Holder. For 33 Series. Accepts sheet specimens up to 0.130 inch thick. 1 inch OD annular ring. Calculations from bridge readings yield permittivity and loss of material.



33-3A Coax N Adapter. For 33 Series. Allows coaxial connection to bridge test posts. Female.

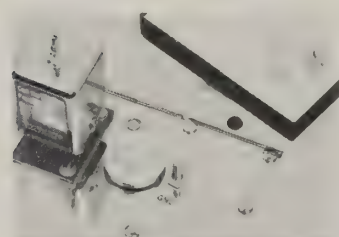


33-4A Set of Work Coils. For capacitance measurements on 33A/1 and 33B/1. 7 coils in case. Standard frequencies.

33-5A Set of Work Coils. As above for 33C/1 and 33D/1.

33-6A Set of Work Coils. For inductance measurements on 33A/1 and 33B/1. 7 coils in case. Standard Frequencies.

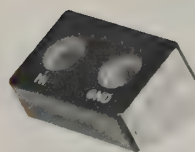
33-7A Set of Work Coils. As above for 33C/1 and 33D/1.



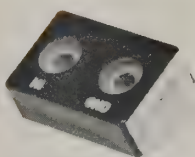
33-8A Zero Conductance Standard. For 33 Series. Establishes conductance correction for high Q measurements. Adjusts up to 50 pF.



33-9B Capacitance Standard. Specifically configured for 33 Series. Values available 5, 10, 20, 30, 50, 75, 100, 125 and 145 pF nominal, $\pm 0.25\%$. Two terminal.



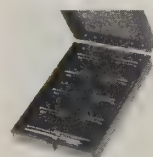
33-10B Conductance Standard. Specifically configured for 33 Series. Values available 2, 10, 20, 100 and 200 μS ; 1, 2, 4, 10 and 20 mS nominal, $\pm 0.5\%$. Two terminal.



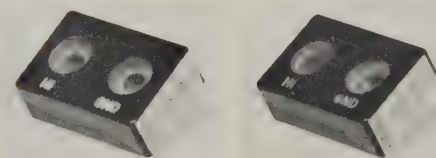
33-11B Capacitance Range Extending Capacitor. For 33A/1 and 33B/1 only. Specific value required for each range extension segment. (Each frequency of use needs coil below). (Request supplementary list.)



33-12A Range Extending Work Coil. For 33A/1 and 33B/1 only. One coil needed for each range extension segment at each frequency. (See above.) (Request supplementary list.)



33-13B Storage Case. For 8 work coils as used on 33 Series.



33-14B C & G Standards Set. For 33A/1. Comprises 33-17B and 33-18B.

33-16B C & G Standards Set. For 33B/1. Comprises 33-17B and 33-19B.

33-17B C Standards Set. For 33A/1 and 33B/1. Comprises 5, 10, 20, 30, 50, 75, 100, 125 and 145 pF values of 33-9B.

33-18B G Standards Set. For 33A/1 and 33C/1. Comprises 10 and 100 μS ; 1, 10 and 20 mS values of 33-10B.

33-19B G Standards Set. For 33B/1 and 33D/1. Comprises 2, 20 and 200 μS ; 2 and 4 mS values of 33-10B.



33-20B Y Parameter Test Fixture. Measures Y_{ic} , Y_{ib} and Y_o on transistors. Mounts on test terminals of 33 series bridges. Needs external bias supply.



34-1A High Impedance Probe. For 92B when used as detector for 34A at frequencies above 500 MHz.



34-2A Attenuator Tube. Restricts radiation losses at open end of 34A. Permits accurate measurements above 500 MHz.



34-3A Radial Lead Swallower. Allows quick connection of radial leaded components at open end of 34A without lead influence.



34-3B Radial Lead Swallower (with built-in series capacitor.) For shunt measurement of larger C values at 100, 300 and 550 MHz on 34A.



34-4A Piston Capacitor Adapter. For 34A Plunger that accepts threaded end of piston capacitor for connection in series with the line. 11/64 inch x 64 threads per inch.

34-4B Piston Capacitor Adapter. For 34A Plunger that accepts threaded end of piston capacitor for connection in series with the line. 0.120 inch x 80 threads per inch.

34-4C Piston Capacitor Adapter. For 34A Plunger similar to 34-4A and 34-4B but undrilled.

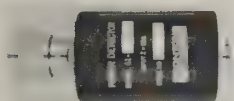
Accessories



35-8A Q Standards. For 35A (obsolete), 77B (obsolete), 75D and 76A, 35-8A/1, $Q \approx 500 \pm 5\%$; 35-8A/2, $Q \approx 1500 \pm 8\%$; 35-8A/3, $Q \approx 5000 \pm 15\%$. $C \approx 100$ pF, $f = 1$ MHz. Other values to special order.



41-2A Detector Cable. 5 ft. special low noise twin cable connects output of 41-4 and 41-5 Series Power Detectors to 42 Series Microwattmeters.



41-4A Power Detector. For 42B Series. 200 kHz — 7 GHz, 1 nW — 10 mW, 50 Ω type N 300 mW cw overload.

41-4B Power Detector. For 42B Series. 200 kHz — 12.4 GHz, 1 nW — 10 mW, 50 Ω type N, 300 mW cw overload.

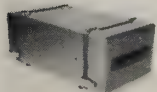
41-4C Power Detector. For 42B Series. 200 kHz — 1 GHz, 1 nW — 10 mW, 75 Ω type N, 300 mW cw overload.

41-4E Power Detector. For 42B Series. 200 kHz — 18 GHz, 1 nW — 10 mW, 50 Ω type N, 300 mW cw overload.



41-5B Power Detector. For 42 C Series. 200 kHz — 12.4 GHz, 10 nW — 100 mW, 50 Ω type N, 2 W cw overload.

41-5E Power Detector. For 42C Series. 200 kHz — 18 GHz, 10 nW — 100 mW, 50 Ω type N, 2 W cw overload.



42-7A Portable Case. For all 42 Series. Metal outside sleeve fits over existing case. Covers front and rear for protection and accessory storage. Carrying handle. Not for shipment.



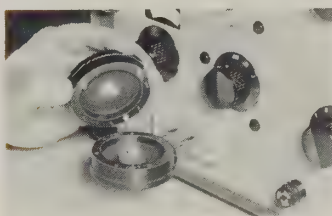
42-13A Transit Case. Fits either 42 Series or 92 Series and accessories. Aluminum suitcase outside. Foam padded. 19"x15"x9".



62-1A Test Fixture Kit. For 62A Series. Comprises compensated test fixture with 30 inch leads, shorting bar and test clips.



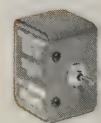
62-2A 1 MHz Inductance Standard. For 62A Series. 3 values in each unit 62-2A/1; 1, 2 and 3 μ H. 62-2A/2; 10, 20 and 30 μ H. 62-2A/3; 100, 200 and 300 μ H. Accuracy $\pm 0.5\%$.



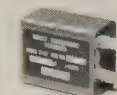
63-11B "Mu Jig" Test Fixture. For 63 Series. Calculations from bridge readings yield permeability and loss of magnetic material in toroidal form.



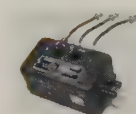
63-15A 1 μ H Inductance Standard. For 63 Series. Series inductance $\pm 0.5\%$, series resistance $\pm 2.0\%$ at 10, 50, 100 and 500 kHz.



71-1A Capacitance Standard and Q Check. For 71 and 72 Series. 100 pF $\pm 0.25\%$ with switch for $Q = 3$ and $Q = > 1000$.



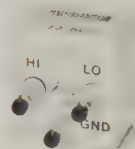
71-2A Capacitance Standard. For 71 and 72 Series. Values available 1, 3, 10, 100, 300 and 1000 pF $\pm 0.25\%$. Plugs directly into test input.



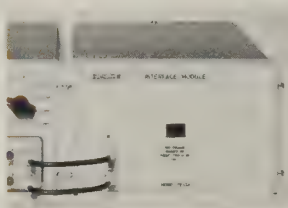
71-12A Capacitance Range Extender. For 71 and 72 Series. Multiplies 10 pF range by 1000 (10,000 pF fs). Measurements must be made at top terminals.



72-4B Test Post Adapter (BNC). For 72 Series. 4 BNC female, test High/Low; differential High/Low.



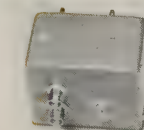
72-5C Test Post Adapter (CLIPS) for 72 Series. 3 push clips for leaded components High/Low/ground.



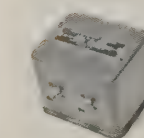
72-13A Interface Unit. For 72B-S1-03 in 170 Series system. Converts dc output of Capacitance Meter to higher level for interface to 54B or 55B Control Units. Has circuit to negate capacitance error caused by test leads.



75-5A 3 to 2 Terminal Adapter. For 75D. Allows measurement of 33-9B and 33-10B two terminal Standards on 75D for correlation between 33 Series and 75D.



75-7A 3 to 2 Terminal Adapter. For 75D. Plug-in box converts 3-terminal bridge test input for 2-terminal measurements in which one side of the test may be grounded. Adjustment negates up to 50 pF of cable capacitance when remote test cable is used.

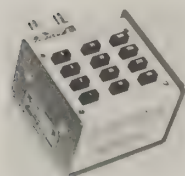


76-1A Capacitance Standard. For 72 Series 75D and 76A. Any value may be specified between 0.01 pF and 1000 pF. Accuracy basically 0.1% above 1.0 pF, decreasing to 4% at 0.01 pF.

Accessories



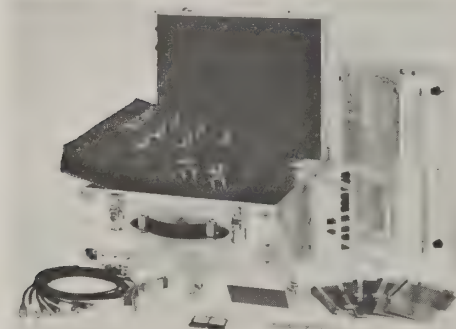
76-2A Capacitance Standard. For 76A only. 17 values available from 0 to 1950 pF with residual G readings. For calibrating 76A. Accuracy $\pm 0.1\%$.



76-3A Precision Decade Capacitor. For 72 Series, 75D and 76A. 1 pF to 1221 pF in 1 pF steps. Accuracy basically 0.1%. Use only at 1 MHz.

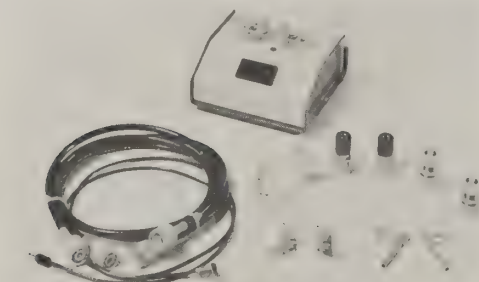


76-4A Conductance Standard. For 76A only. 18 values available from 0 to 1900 μS with residual C readings for calibrating 76A. Accuracy $\pm 2.0\%$.



76-8A Test Kit. For 76A only. Comprises 17 values of 76-2A and 18 values of 76-4A plus other parts, accessories and test PROMS needed for full C & G calibration of 76A.

76-8B Test Kit. For 76A S.N. 436 and above. Same as 76-8A less PROMS which are not required for S.N. 436 and above.



76-9A Test Fixture Kit. For 76A. Comprises 76-6A Test Fixture, 30 inch test cables, trigger lead, various adapters and test clips.



77-2A Capacitance Range Extender. For 75D and 76A. Multiplies C and G readings by 1000. Usable up to 0.1 μF and 1S. Measurement must be made at top terminals. C accuracy generally $\pm 1\%$ to $\pm 2\%$; G accuracy $\pm 10\%$.



77-4A Capacitance Range Divider. For 71 and 72 Series. Divides 1 pF range by 10 (0.1 pF fs). Accuracy generally $\pm 2.5\%$. Test level 150 mV rms.



82-1A Rack Mount Kit. For 82AD. Two flanges with handles mount to both sides to adapt to 19 inch rack.



82-2A Extender Card. For 82AD. Allows plug-in boards to be operated in elevated position for servicing.



91-4C Low Frequency RF Probe. For all RF Millivoltmeters. 1 kHz to 250 MHz. Overload protection, 10 V ac and 200 V dc.



91-6C Underterminated BNC Adapter. For all probes. For coaxial connection up to approximately 100 MHz or to 400 MHz when fed from a low impedance source in an electrically-short system. Female.

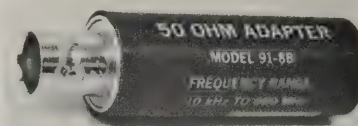
91-6E Underterminated TNC Adapter. For all probes. Male. Electrically same as 91-6C.

91-6F Underterminated Jerrold Type "F" Adapter. For all probes. Female. Electrically same as 91-6C.

91-6G Underterminated BNC Adapter. For all probes. Male. Electrically same as 91-6C.



91-7C 100:1 Voltage Divider. For all probes. Attenuates input signal by a factor of 100 ($\pm 1\%$). Measurements to 300 volts, rms measuring range to 3 volts. 50 kHz to 700 MHz. Maximum input 1000 volts, dc plus peak ac.



91-8B 50 Ohm BNC Adapter. For all probes. For measurements up to 600 MHz in a 50 ohm system. Female. Furnished with Millivoltmeter.

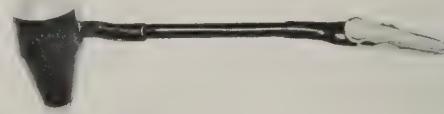
91-8B/1 75 Ohm BNC Adapter. For all probes. Female.

91-8B/1A 75 Ohm Jerrold Type "F" Adapter. For all probes. Female.

91-8B/2 93 Ohm BNC Adapter. For all probes. Female. (Available in other impedances).



91-12F RF Probe. For all RF Millivoltmeters. 10 kHz to 1.2 GHz; useful response for relative measurements to beyond 4 GHz. Overload protection 10 V ac and 400 V dc. Furnished with Millivoltmeter.



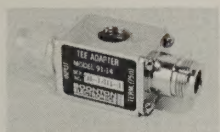
91-13B Probe Tip. For 91-12F, 91-4C and 91-7C. With grounding clip lead for use to approximately 100 MHz. Furnished with Millivoltmeter.



91-14A 50 Ohm N TEE Adapter. For 91-12F RF Probe. Permits connection into 50 ohm line; frequency range to 1.2 GHz. Female/Female.

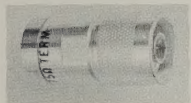
91-14A/1 75 Ohm N TEE Adapter. Female/Female.

Accessories



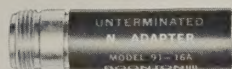
91-14B 50 Ohm N TEE Adapter. Same as 91-14A except input connector is N male.

91-14B/1 75 Ohm N TEE Adapter. Same as 91-14A/1 except input connector is N male.



91-15A 50 Ohm N Termination. For 91-14A and 91-14B Tee Adapter.

91-15A/1 75 Ohm N Termination. For 91-14A/1 and 91-14B/1 Tee Adapter.



91-16A Underterminated Type N Adapter. For all probes. For coaxial connection up to approximately 100 MHz or to 400 MHz when fed from a low impedance source in an electrically-short system. Female.



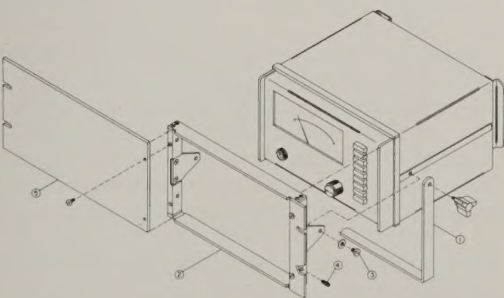
91-18B Storage Container. For Volt-meter accessories.

91-24A 50 Ohm Accessory Kit. Comprises 91-6C, 91-7C, 91-14A, 91-15A and 91-18B.

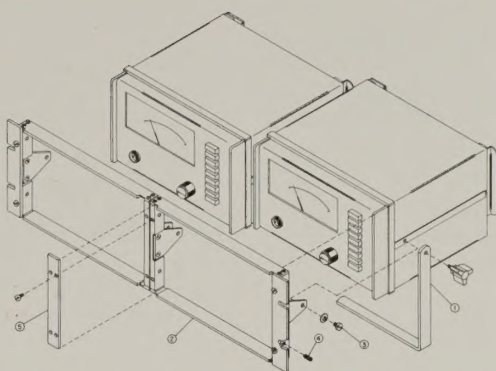
91-24A/1 75 Ohm Accessory Kit. Comprises 91-6C, 91-7C, 91-14A/1, 91-15A/1 and 91-18B.



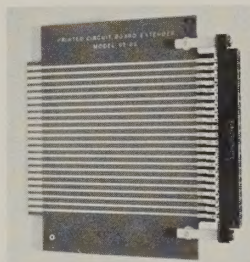
91-25A Banana Pin Adapter. For all probes. 3/4 inch spacing.



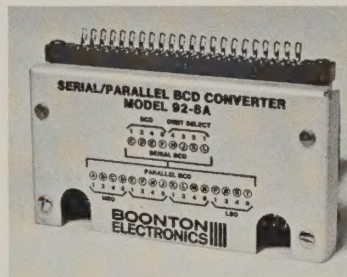
92-1A Rack Mounting Kit (Single). For 25A and 26A also 42, 62, 72, 92 and 93 series half rack instruments. Mounts one unit to left or right of blank panel. 5.25 inch high.



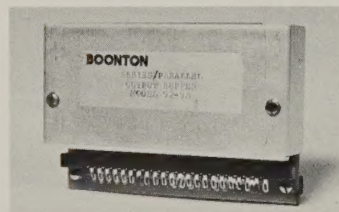
92-1B Rack Mounting Kit (Dual). For 25A and 26A also 42, 62, 72, 92 and 93 series half rack instruments. Mounts two units side by side. 5.25 inch high.



92-6A Extender Card. For 42, 62, 72, 92 and 93 series. Allows plug-in boards to be operated in elevated position for servicing.



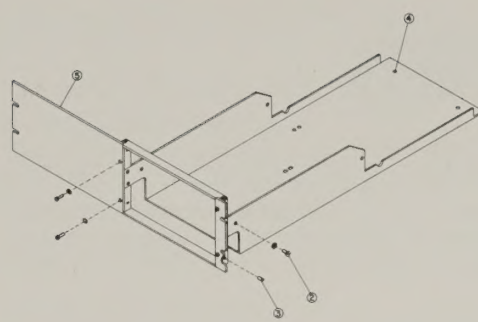
92-8A BCD Serial/Parallel Converter. For 42BD, 42CD, 62AD, 72BD and 92BD. Converts serial data output to parallel BCD output. TTL/DTL compatible. Sinks 1.6 mA. Plugs on rear. 1 inch deep.



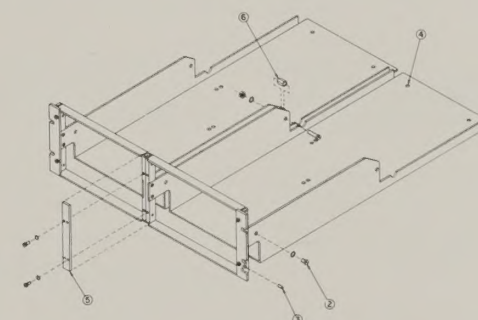
92-9A Buffered BCD Serial/Parallel Converter. For 42BD, 42CD, 62AD, 72BD and 92BD. Converts serial data output to parallel BCD output. TTL/DTL compatible. Sinks 16 mA. Plugs on rear. 1.5 inch deep.



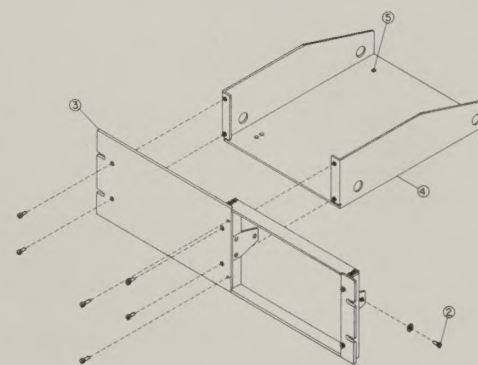
92-10A Portable Case. For 92 series. Metal outside sleeve fits over existing case. Covers front and rear for protection and accessory storage. Carrying handle. Not for shipment.



92-12A Rack Mounting Kit (Single). For 42BD, 42CD, 62AD, 72BD, 92BD and 93AD. Mounts instrument with 10A Bus Interface Unit to rear. Left or right of blank panel. 5.25 inch high, 24.0 inch deep.



92-12B Rack Mounting Kit (Dual). For 42BD, 42CD, 62AD, 72BD, 92BD, 93AD. Mounts two instruments with 10A Bus Interface Units to rear. 5.25 inch high, 24.0 inch deep.



92-12C Rack Mounting Kit (Single). For 42BD, 42CD, 62AD, 72BD, 92BD, 93AD. Mounts 10A Bus Interface Unit to left or right of instrument. 5.25 inches high, 13 inches deep.



93-1A High Impedance Probe. For 93 Series. 10 MΩ, <11.5 pF input, x 10 attenuation. Six foot lead. Prober tip.



93-2A BCD Serial/Parallel Converter. For 93AD. Plugs on rear of unit. Converts serial data output to parallel BCD. TTL/DTL compatible. Sinks 1.6 mA. 1 inch deep.

REPRESENTED BY:

BOONTON

BOONTON ELECTRONICS CORP. ■ PARSIPPANY, N.J. 07054 U.S.A. ■ (201) 887-5110 TWX: 710-986-8241

Specifications are subject to change without notice.

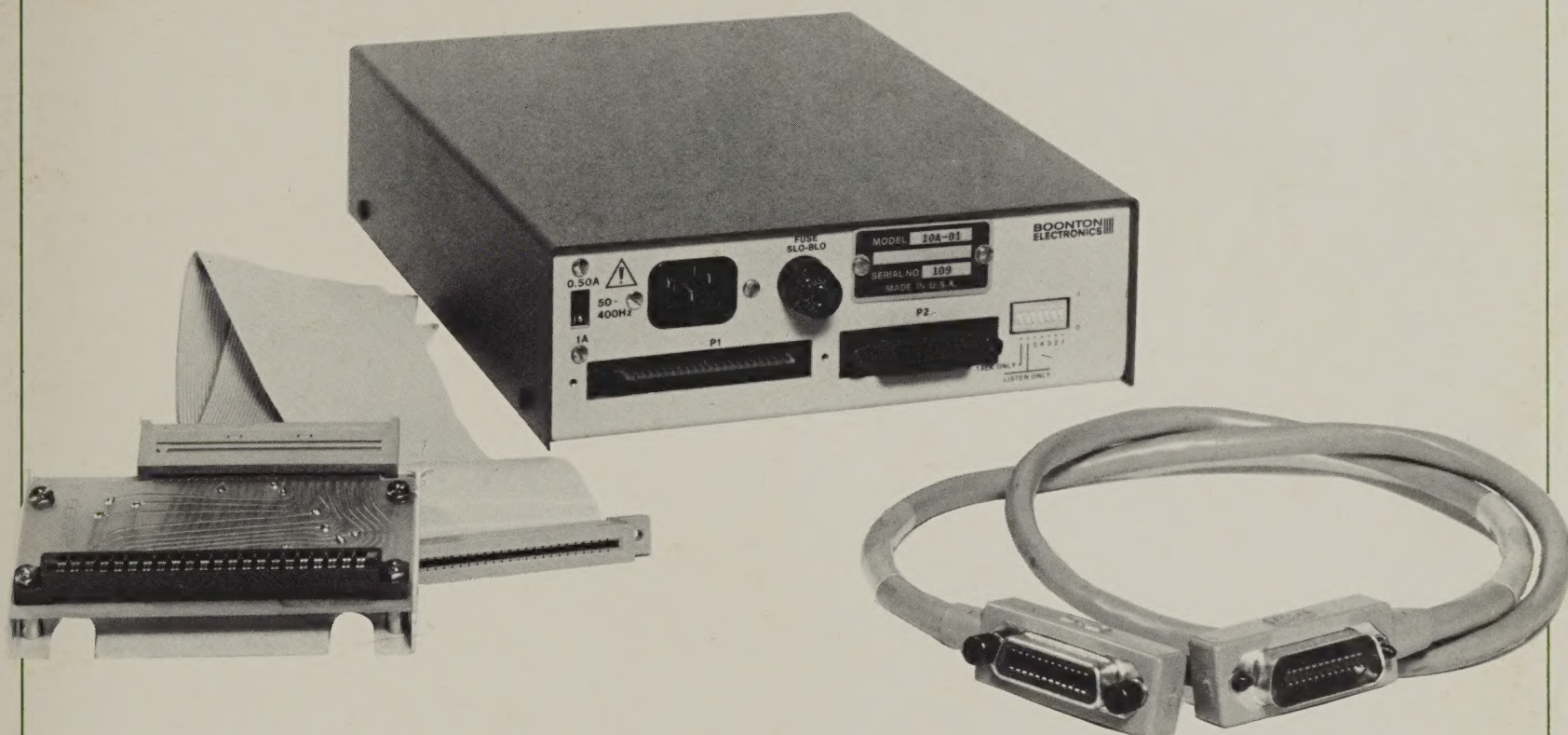
Printed in USA

BOONTON

Model 10A IEEE-488 Bus Interface Unit

ISSUE #1

ADAPTS ALL BOONTON DIGITAL METERS TO THE IEEE-488 STANDARD BUS INTERFACE



- ☐ Eliminates compatibility problems of couplers designed for general application.
- ☐ Works with all Boonton digital meters including most of those already in use.
- ☐ Complete with interconnecting cable and standard bus cable.

GENERAL

The Model 10A IEEE-488 Bus Interface Unit allows all Boonton digital meter type instruments to be adapted for use within a system on the bus. It allows the instrument to become either a talker or listener or both under the direction of a controller such as a bus interfaceable calculator.

The design employs a microprocessor that follows programs stored in a PROM. This PROM may easily be exchanged to adapt the bus interface unit to other Boonton meters. An option number designates the PROM installed.

The 10A cabinet can be mounted to any convenient surface within the rack by using four captive nuts that are installed in the base of the unit.

Single or dual rack mounting kits are available that mount a measuring instrument at the front with its Bus Interface unit to the rear. This eliminates the need to give up rack space to the 10A.

A line input is required by the 10A but an on/off switch is not needed. The unit senses when its companion measuring instrument is on or off and switches itself in unison.

SPECIFICATIONS

Interface Functions:

- SH1 Source handshake capability
- AH1 Acceptor handshake capability
- T7 Talker (basic talker, no serial poll talk only mode, unaddressed to talk if addressed to listen)
- L3 Listener (basic listener, listen only mode, unaddressed to listen when addressed to talk)
- SRO No service request capability
- RL1 Remote/Local capability
- PPO No parallel poll capability
- DC1 Device clear capability
- DT1 Device trigger capability
- CO No controller capability

Address Selection: Seven position, rear panel DIP switch selects address code and TALK ONLY, LISTEN ONLY, or TALK AND LISTEN modes.

Talk Only Mode: Model 10A will continuously output data.

Listen Only Mode: Model 10A can receive commands from remote controller.

Talk and Listen Mode: Model 10A can both output data and receive commands from remote controller.

Model Selection:

Option	Used With:
10A-01	Model 42BD Microwattmeter
10A-02	Model 62AD 1 MHz Inductance Meter
10A-03	Model 72BD 1 MHz Capacitance Meter
10A-04	Model 92BD RF Millivoltmeter
10A-05	Model 93AD True RMS Voltmeter
10A-06	Model 42CD Microwattmeter

NOTE: Any option can be converted to any other option by changing a field installable PROM. Model 10A-05 option requires a different cable between the 10A and 93AD.

Cables Supplied:

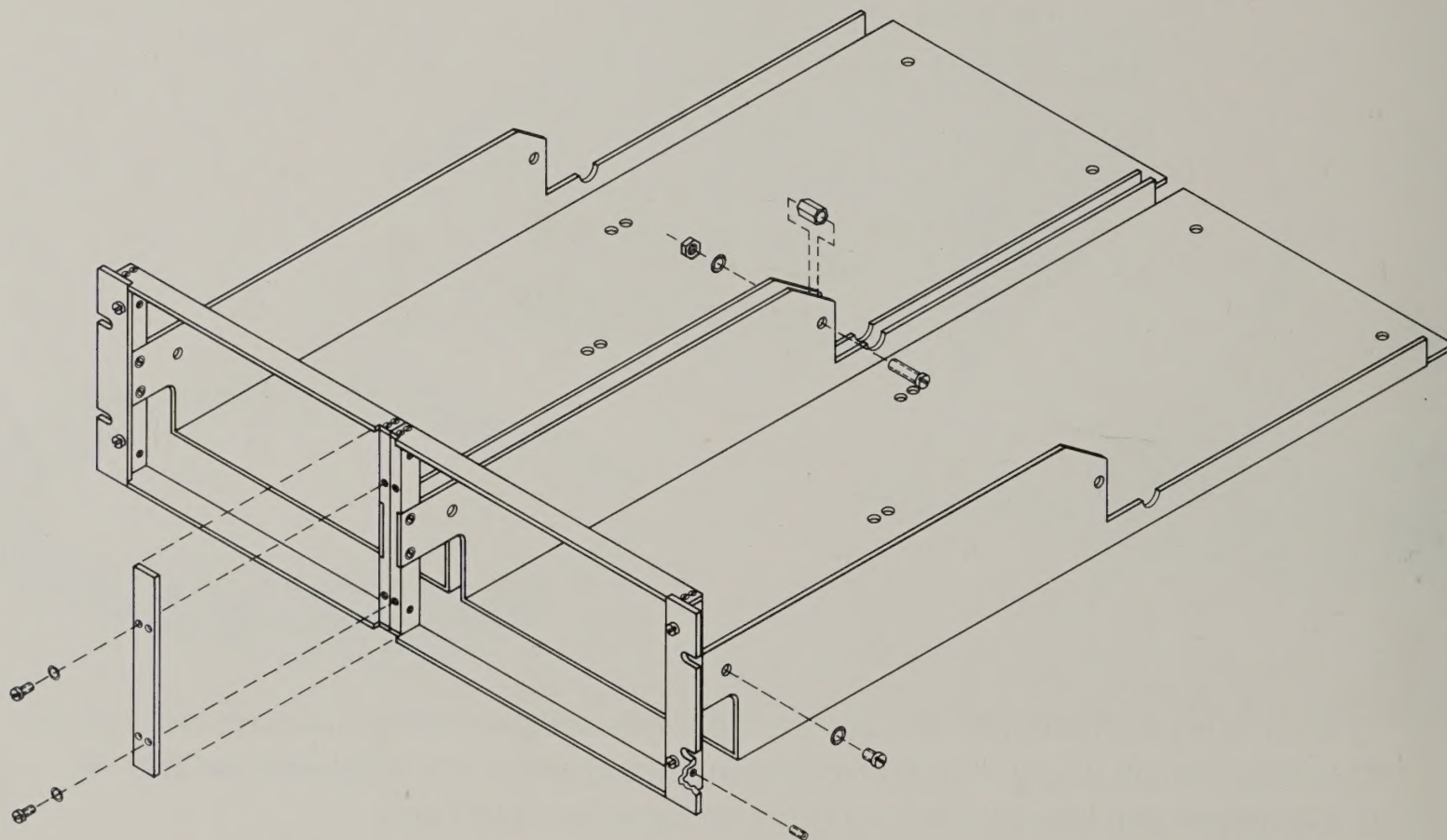
- 1 — IEEE-488 Bus Interface cable, length 1 m.
- 1 — Connecting cable from 10A to instrument under control, length 40 cm.

Power Requirements:

120 V, 1A or 240V, 1/2A; 50-400 Hz.

Dimensions:

8"W x 10½"L x 3"H (20.3 x 26.7 x 7.6 cm)



Model 92-12B Dual Rack Mounting Kit

BOONTON

BOONTON ELECTRONICS CORP.

■ RTE. 287 AT SMITH ROAD, PARSIPPANY, N.J. 07054

■ (201) 887-5110

Specifications are subject to change without notice

Printed in U.S.A.